# A Survey of The Use of Motion Pictures in Flight Training By The United States Navy

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# A SURVEY OF THE USE OF MOTION PICTURES IN FLIGHT TRAINING BY THE UNITED STATES NAVY

by

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# CHAPTER I

# THE PROBLEM AND DEFINITIONS OF TERMS USED

The training of an aviator has grown from a simple transference of motor skills in its early days to a complex and time-consuming educational process. Before the pilot of today climbs into his aircraft, he must know not only how to fly the plane, but also what makes it fly--both mechanically and aerodynamically. He must be able to fly the aircraft safely under instrument conditions; he must recognize weather phenomena and how they affect the flight of his plane; he must be thoroughly versed in communications procedures; and he must understand completely information from dozens of other interrelated fields in order to fly his aircraft safely and efficiently. This, then, is the situation confronting the new Naval Aviation Cadet. With no previous aeronautical experience, he must--in eighteen months of intensive training--acquire all the skills and knowledge which will enable him to take his place on America's defense team as a competent and effective Naval aviator.

## I. THE PROBLEM

Statement of the problem. It was the purpose of this study (1) to investigate the development of the audio-visual training program of the United States Navy; (2) to examine

the flight training program of the Navy with reference to the areas in which motion pictures and other audio-visual aids are used; (3) to analyze some of the needs and problems of the schools where flight training is conducted; and (4) to determine the extent to which motion pictures help solve these problems.

Importance of the study. At the present time world conditions are so unsettled that the United States is maintaining its armed forces in a state of preparedness for whatever may occur. This is particularly true in the field of aviation, which, in this atomic age, is our first line of defense. Since the physical stamina demanded by present high-performance aircraft can be met primarily only by young men, the training of aviators is a never-ending task.

The training of a Naval aviator is an undertaking which requires about eighteen months time and an expenditure of approximately $90,000. It is quite natural, therefore, that the training program be examined constantly for efficiency and thoroughness and that any method of instruction which will reduce the time and money expended and/or increase the effectiveness of the training be given utmost consideration. The motion picture, because of its proven educational value, is being utilized to a higher degree in flight training than ever before. A study of the use of motion pictures in this field will prove of interest not

only with respect to the objectives which it seeks to accomplish here, but it will also point the way to other fields in which the motion picture may be used with equal facility.

## II. DEFINITIONS OF TERMS USED

Flight training. Flight training is the formal program of instruction through which the trainee passes from the time he is accepted as a student Naval aviator until he is officially designated a Naval aviator. This training program is divided into three separate and distinct steps--Pre-Flight, Basic Training, and Advanced Training.

Pre-Flight. Pre-Flight is the first school which the cadet enters after having been selected for flight training. Here, for a period of fifteen weeks, he is taught theory of flight, aerology, navigation, engineering, communications, and other subjects which will give him the necessary background for actual flight.

Basic Training. It is in this stage of training that the student actually begins to fly. He learns to take off, land, and to perform basic emergency procedures before he solos his training-type aircraft. Then he learns acrobatics, gunnery, formation flying, instrument flying, and actually lands aboard an aircraft carrier.

Advanced Training. In Advanced Training the student

flies the same type of aircraft he will fly when he joins a fleet squadron. In addition to making the transition from training aircraft to combat aircraft, he also learns the tactics and operational procedures which he will employ within the squadron. Ground school, as well as flight instruction, is continued to the completion of the program.

## III. REVIEW OF PREVIOUS RELATED LITERATURE

In surveying the literature in the field of motion pictures in flight training, no books were found which dealt specifically and exclusively with this area. However, a number of references were found relating to the use of audio-visual materials within the Navy. Certain books among the literature examined contained references to motion pictures and other audio-visual aids which were used within the Naval aviation training program. Many other references of a limited nature were found in motion picture and trade magazines, journals, and periodicals.

One other thesis has been written on the subject of motion pictures and aviation at the University of Southern California.[1] This thesis is a general survey of the field of motion pictures and instrument flying. It covers

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[1] William E. Stephens, Jr., "A Survey of the Uses of Motion Pictures in Instrument Flight" (unpublished Master's thesis, University of Southern California, Los Angeles, (1951).

training films used in instrument flight, eye movement studies, a discussion of some of the problems involved in instrument flight, and films on new aids to instrument flying. Since instrument flight is one of the vital skills which must be acquired by the student Naval aviator, this area will be slightly overlapped by the present thesis. However, the subject will be discussed with reference to the new films which have been produced and to the new techniques now applied in the area.

No literature was found which dealt with the audio-visual training program of the armed services prior to World War II. There were many books which related to motion pictures in education and to the use of other audio-visual materials, some of them concluded even before 1920, but the first coördinated team studies were conducted by F. N. Freeman and a research staff which he assembled at the University of Chicago.[2] This study, aided by a small grant from the Commonwealth fund, investigated such areas as perceptual-motor learning, motivation, various methods of film use, types of verbalization, and film content. It also compared the teaching effectiveness of films with that of other instructional materials and procedures.

The first books which were concerned with audio-visual

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[2] Frank N. Freeman, Visual Education (Chicago: University of Chicago Press, 1924).

methods in the armed forces appeared shortly after World War II. The services, reenforced by many of the leading audio-visual educators, made unprecedented growth in this field during the period 1941-1945, and by the end of the war had surpassed the educational institutions in effective utilization of training films and other audio-visual aids. John Miles and Charles Spain, working for the Commission on Implications of Armed Services Educational Programs, surveyed the audio-visual programs of the armed forces with a view to their adaptability to the American educational system in time of peace.[3] William Exton, a Naval Reserve Captain who helped to formulate the training program within the Navy, had the same purpose in mind--to make available the benefits of the experience of the armed forces in the creation of audio-visual materials for educational purposes.[4] His book is more closely related to the subject of this thesis than any other which was discovered during the course of this investigation.

The U. S. Navy Training Film Catalogue lists approximately 5000 training films. Many of these films are on the

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[3] John R. Miles and Charles R. Spain, Audio-Visual Aids in the Armed Services (Washington: American Council on Education, 1947).

[4] William Exton, Jr., Captain, USNR, Audiovisual Aids to Instruction (New York: McGraw-Hill Book Company, Inc., 1947).

subject of flight training and will be listed in the Appendix.

The Instructional Film Research Program, conducted at Pennsylvania State College in conjunction with the Office of Naval Research and the Naval Special Devices Center, is engaged in research to determine the principles of effective production and utilization of film instructional devices. Many of the problems inherent in the flight training program of the Navy have been investigated by this group. At the present time more than one hundred reports have been written on various phases of the study, and references from many of them will be quoted later in this thesis. One of the reports in this series was particularly useful in locating material related to the subject.[5]

In addition to consulting books on fields related to the subject, research was conducted in trade magazines, journals, and periodicals. The *Reader's Guide to Periodical Literature* was examined from 1945 to date and several related references were found. Several useful articles were found in *Business Screen*, dating back to 1942. Many references to the Navy's flight training program were found in *Flying*, and several more were found in *Aviation Week*.

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[5] *A Bibliography of Production, Utilization, and Research on Instructional Films* (Technical Report SDC 269-7-40, Instructional Film Research Program; State College, Pennsylvania: Pennsylvania State College, 1953).

Educational Screen, Film News, and Film World were consulted; however, no pertinent references were found. All of the instructions pertaining to the flight training syllabus, both ground and flight, were obtained from the Naval Air Training Command, and these are used in the body of this thesis.

## IV. METHOD OF PROCEDURE AND SOURCES OF DATA

The primary purpose of this thesis is to show the extent to which motion pictures and other audio-visual aids to instruction are used in the flight training program of the United States Navy and to show how these aids help to solve the problems encountered there. A personal visit was made by the author, a Naval Aviator and a graduate of the Naval aviation training program, to the Headquarters of the Naval Air Training Command at Pensacola, Florida. Here, copies of all the instructions pertaining to flight training were obtained--including the complete ground and flight school syllabi for Pre-Flight, Basic, and Advanced Training. In addition to this, training officers from each of the commands were interviewed, and actual classroom visits were made where this writer viewed the use of training films and audio-visual aids and observed the techniques employed by instructors within the classes. A copy of the Aviation Training Film Catalogue was obtained from the Film Library of the Naval Air Station, Pensacola. This catalogue lists

more than 1600 films, many of which are used in flight training. Copies of the Navy Training Film Catalogue and the Navy Catalogue of Special Devices--listing all of the audio-visual materials used within the Naval Organization--were obtained. Visits were also made to the film libraries of the Naval Air Station, San Diego, California, and the Naval Air Station, Los Alamitos, California, and several films not previously seen were viewed there. A number of films employed most extensively in the flight training program are listed in the Appendix.

In order for the reader to understand the audio-visual situation as it exists within the Navy at the present time, the historical development of Naval audio-visual training is discussed in Chapter II. A personal visit was made to the U.S. Naval Photographic Center, Anacostia, D.C., to obtain information on the history and development of the training program of the Navy. Other information was obtained from the library of the Naval Air Station, Pensacola, Florida, The Los Angeles Public Libraries, and the Library of the University of Southern California.

## V. ORGANIZATION OF THE REMAINDER OF THE THESIS

In the next chapter the historical development of audio-visual training within the Naval Organization is discussed. Chapter III reviews the ground and flight syllabi of Pre-Flight, Basic, and Advanced Training. Chapter IV

examines in detail particular courses and areas in which instructional films are utilized and shows their relationship to other methods of instruction in the same field. Chapter V analyzes some of the needs and problems encountered by the flight training schools and the extent to which these problems can be solved by motion pictures. Chapter VI consists of a summary, conclusions, and recommendations.

# CHAPTER II

# HISTORICAL DEVELOPMENT OF AUDIO-VISUAL TRAINING WITHIN THE NAVY

In order to understand the audio-visual situation as it exists in the Naval aviation training program today, it is necessary to realize the vast change that occurred within the training structure of the Navy during the period of World War II.

Training aids before World War II. No literature was discovered relating to the use of films in flight training prior to World War II. Motion pictures and audio-visual aids were practically non-existent in the training programs throughout the Navy. The few audio-visual aids which were in use were produced locally by the schools or commands utilizing them. Obviously, such conditions were not conducive to optimum utilization of manpower in wartime. As late as the spring of 1941, the Training Division of the Bureau of Navigation (now the Bureau of Naval Personnel) of the Navy Department, which had cognizance of virtually all training ashore, was providing nothing that could properly be called a training aid.[1] The so-called "Slide Film

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[1] William Exton, Jr., Captain, USNR, Audiovisual Aids to Instruction (New York: McGraw-Hill Book Company, Inc., 1947), p. 5.

School"--a collection of slide films on various subjects--had been allowed to become obsolete and inactive, as was the case with some early 35-mm training films produced in the 1920's. The training aids which were used by the Navy were acquired locally, at the initiative of those conducting individual training activities. Sporadic attempts to use pictures in Naval training were made as long ago as World War I, but not until August, 1941, was any serious, continuing effort made to use pictures throughout the Navy.[2]

In the summer of 1941 one junior reserve officer was working part time in the Bureau on the development, acquisition, and distribution of training aids, primarily films. The production of Navy training films and filmstrips began to increase considerably in response to the August, 1941, directive of Frank Knox, Secretary of the Navy, to the Chief of the Bureau of Aeronautics to fulfill the photographic requirements of education and training in Naval Service.[3]

Locally developed aids. In the early days of the war there were very few training aids available to assist the

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[2] United States Navy Department, Bureau of Naval Personnel, "Audio-Visual Aids Board Survey" (unpublished manuscript, Washington, 1942), p. 1.

[3] John R. Miles and Charles R. Spain, Audio-Visual Aids in the Armed Services (Washington: American Council on Education, 1947), p. 27.

various Naval training schools in illustrating and implementing the generally brief statements of objectives, methods, and content of official courses of study. Local schools, therefore, began early to utilize their various resources for the development of teaching materials. Many schools acquired staffs which included educators, writers, artists, draftsmen, machinists, carpenters, and others with professional or vocational competence. In many cases, civilian assistants also were employed, either to teach or to develop teaching materials, and often developmental approaches designed by industry or by government agencies (as the training within industry methods) were introduced. The Destroyer Base at San Diego, California, began early experimentation with films and filmstrips and probably initiated the first widespread use of such materials in Navy training.[4]

The Navy Bureau of Aeronautics flight training schools were centrally controlled even before Pearl Harbor. Hence, many of the courses and materials in additional wartime fields were centrally planned at (or before) the time of their commissioning. The early schools at Pensacola, Florida, and the schools commissioned in 1941 at Jacksonville, Florida and Corpus Christi, Texas, provided an experiential background which permitted much immediate

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[4] Miles and Spain, op. cit., p. 38.

standardization of methods and syllabi of instruction at the new wartime fields. The establishment of the Naval Air Technical Training Command in September, 1942, also tended to centralize control of technical training of enlisted aircrewmen. Courses and training materials were planned in the Bureau, although considerable local improvisation of training devices was necessary. Necessity for such improvisation can be seen in the fact that these Naval technical schools were early alloted some six hundred and forty modern aircraft for training purposes and twenty-one were actually allocated by the fall of 1942, but none were received. As a result, Navy instructors and supervisors went to Navy "boneyards" and crashes to seek the parts to build mockups or other training devices.[5]

Training Aids Development Center. The necessity for central design and production of training aids was quite apparent by 1942, and the United States Navy Training Aids Development Center (TADC) was established in that year as an adjunct to the Planning and Production Unit of the Training Aids Section of the Training Division of the Bureau of Naval Personnel. This Center was charged with providing the Unit with adequate facilities for the design and development of

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[5] United States Navy Department, Bureau of Aeronautics, "History of Navy Air Technical Training" (manuscript on file in Bureau of Aeronautics, Navy Department, Washington, /n.d./).

non-photographic training aids. Three major departments were developed in TADC: an engineering department to produce models, mockups, or other three-dimensional aids; an engineering illustration department to produce technical charts and cross-sectional illustrations; and a graphics department to develop charts and posters not emphasizing the technical aspects of instruction. Expert artisans were assigned to the several shops which served these three departments in designing and manufacturing the various aids--the drafting room, the artshop, the machine shop, the carpenter shop, the sheet metal and casting shop, the photography and enlarging room, the duplicating room, and the silk-screen room.[6]

Special devices. In the field of aviation there had been a special development which had perhaps gained its greatest impetus in Great Britain. The British were severely handicapped in their efforts to train pilots during the early years of the war. Apart from the difficulties imposed by the climate, which provided comparatively little weather suitable for basic flight training, there were great obstacles in the scarcity of aircraft fuel and in the fact that the Luftwaffe pilots were not at all unlikely to appear over an airfield and shoot down the training planes. The

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[6] United States Navy Department, Bureau of Naval Personnel, "History of the Training Aids Development Center" (manuscript on file in the Office of Naval History, Navy Department, Washington, [n.d.]).

British determined to give a maximum of training on the ground and developed a number of ingenious devices that saved time, gasoline, and pilots by developing many of the constituents of flying skill without actual flight. A good pilot could thus be developed with far fewer hours in the air. The devices that produced this training were called "synthetic," and the term is now widely applied to devices that provide an acceptable substitute for experience without actual equipment.

Since the production of large and complex training devices for the Navy was the primary responsibility of the Bureau of Aeronautics, officers of this Bureau studied the production and utilization of these British synthetics in great detail. The United States Navy was favorably impressed, and, beginning as a single "desk" of the Engineering Branch of the Bureau of Aeronautics in 1940, "Special Devices" became successively a Section, and then a separate Division of the Bureau of Aeronautics.[7] Finally, in 1945, the Special Devices Division was placed directly under the Chief of Naval Operations and more recently has become a major division of the Office of Naval Research. This expansion from a single billet in the Bureau of Aeronautics to an organization of several thousand officers and men, expending over fifty million dollars in the last year

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[7] Miles and Spain, loc. cit.

of the war, indicates the unique place that special devices has come to have in Navy training. While this agency was originally concerned only with aviation training, it came to be a means of providing devices for submarine, meteorological, ordnance, and other types of training.

In aviation training, the production of synthetic training devices spearheaded the introduction of instruction based on analyses of combat actions. Better integrations of skill, knowledge, and judgement in the areas of aerology, communications, ordnance, navigation, mechanics, and flight were shown to be essential for the survival of aviators and their crews. Innovations such as deflection gunnery, the Thatch weave in flight maneuvers, and the night-carrier operations of the Navy all required adaptations in individual and crew training. The adaptations were effected in large part by special devices, for neither the equipment nor the time was available for the actual flight practice characteristics of prewar aviation training. As early as June 15, 1943, a subcommittee of the House of Representatives, investigating Naval Air Training, reported:

> Two things are outstanding in the recent development of Naval Aviation training: the development of special devices--and of operational training. Synthetic devices have added tremendously to the efficient training of Naval aviators, bombardiers, gunners, and other aviation personnel, and in the subcommittee's opinion are the equivalent of hundreds of hours of additional training in the conventional manner. The invention, development, and production of synthetics has been only short of

> miraculous. They are universally accepted by the service.[8]

Production of these new devices was often a matter of intense research and invention in devising means whereby intelligence and knowledge gained from combat reports could be introduced into training by synthetic simulations of flight conditions. Final production of such devices was always done by commercial agencies after perfection of "pilot" models which were to be duplicated. The Special Devices Division supervised the installation and maintenance of these devices at the many training fields and aboard aircraft carriers through the services of several hundred officers specially trained for this responsibility. The production of devices generally included the following steps: first, designing the device; second, the prototype stage; third, testing and approval of the prototype; fourth, final production and testing of the product; and fifth, distribution of these approved devices according to lists made up by the agency originally requesting the device and by the Training Aids Division or other central training agency having cognizance over the training program involved.

Film production. At the beginning of World War II, the Navy relied primarily on civilian firms, mainly the principal non-theatrical film producers, for the production

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[8] Ibid., p. 58.

of its training films. Naval officers were assigned as technical advisers to ensure desired and accurate content; officers of the Training Film Unit of the Bureau of Aeronautics, acting as project supervisors and sometimes as educational consultants, coördinated and controlled the production process from script writing to final cutting, as performed under contract by the commercial producer. However, with the establishment in 1943 of the Photo-Science Laboratory at Anacostia, D.C., the Navy entered the producing field itself.

The production of training films generally followed a basic pattern. A need had to be established first for which no adequate film was available. A priority board of officers who knew the contemporary status of the training program, the production facilities available, the educational values of the proposed training film, and the films and devices already available from other subjects, reviewed the requests. These requests came from individual schools or perhaps from inspection reports or surveys of training made by headquarters or subordinate training commands. If the priority board approved these requests, it also scheduled production, assigning a priority number to a particular production according to the urgency of the need for it. The production agency was then ordered to initiate a project to plan or to make the needed film.

Production of training films generally involved the

services of a technical adviser, an educational consultant, and a project supervisor, who were usually designated soon after the request had been approved and given a priority for production. The script writer assigned generally visited the requesting agency in order to familiarize himself with the subject matter to be presented as well as with the purpose of the film. Pertinent information was sought from government agencies, commercial sources, or headquarters agencies. The script writer was carefully supervised by the above consultants, such supervision increasing as the war progressed. Completed scripts were submitted to the training division and to the agency originally requesting the film. The approved or modified script was then produced with the technical and educational advisers continuously coöperating with the supervisor. Test prints of the film were sent to headquarters and to the requesting agency for approval. Qualified individuals or groups then evaluated the film to determine how good a motion picture it was, whether the values of the medium were effectively utilized, how well the picture accomplished the specific purposes originally stated, and how well the picture was adapted to the training program. If the film was found to be satisfactory in these respects, initial distribution lists of prints of the film were formulated.

Distribution of training aids. At the beginning of

the war, centrally-produced training aids, primarily films, were distributed directly by agencies in the Navy Department. Central distribution began to prove unsatisfactory, however, when rapidly increasing demands for training films occurred in 1942. A survey made by the Navy in September, 1942, showed that distribution of films increased from 2,000 prints in January to almost 50,000 in August.[9] Recommendations were made, therefore, for reorganizing of these agencies and decentralization of the distribution of training materials. Distribution agencies were established in both the Bureau of Aeronautics and the Bureau of Naval Personnel, each of which submitted lists to the Training Film Unit for initial distribution of films. The early training aids libraries established in each Naval district and the later training aids sections established at all major Naval bases then distributed all centrally-produced training aids.

The aviation forces established library systems, actually begun before the war, to bring the estimated proper number of prints of a film into the area library nearest to the classrooms which needed them, including those in ships at sea or at advanced bases overseas. The "right film at the right place at the right time" was the primary

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[9] United States Navy Department, Bureau of Naval Personnel, "Audio-Visual Aids Board Survey."

objective.[10] The previously mentioned initial distribution lists allocated a certain number of prints of each new film to each district library according to the needs of the schools in that district as estimated on the basis of the over-all training program and the requests of the schools themselves. The libraries then loaned the films on a short-time (or, if warranted, long-time) basis to local schools and usually developed facilities for maintaining the short-loan films in good condition.

Utilization of training aids. The learning environment in most service training schools during World War II was quite different from that encountered in conventional schools, and it was a "felt" responsibility by most instructors to remind students that learning was but preparation for battle situations. Thus, training aids became a means of perhaps eventually "saving your own skin," as well as learning how to destroy an enemy. While there were doubtlessly many exceptions, most servicemen felt this pressure "to be ready." Utilization of training materials was considered in the light of this tendency of students to want to learn as well as of instructors to want them to learn. Training aids were employed, first, to cultivate this psychological readiness, and second, to provide "more learning

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[10] Charles F. Hoban, Jr., Movies That Teach (New York: The Dryden Press, Inc., 1946), Chap. VI.

in less time" by simplifying, clarifying, and integrating the facts, principles, skills, and judgments which men needed to perform their military duties. From the beginning of the war, military training operated on the assumption that "the superior effectiveness of motion pictures, models, and other visual and aural devices had been well demonstrated in civilian education," and that "their employment in the war situation became a matter of applying superior tools to the problem at hand."[11]

In the early days of the war, the scarcity of adequate equipment and training aids was paralleled by a scarcity of trained instructors. The best trained personnel were demanded aboard ships and in planes because their experience was necessary in combat immediately. Yet, to have well-trained aviators, it was necessary to have well-trained instructors. Here the situation was critical: there were not enough trained personnel available for assignment to all the jobs which needed doing. In many cases, therefore, trainees who had no previous military experience were assigned duties as instructors. Various surveys have indicated that far more than half the instructors in the early days of the war had had no previous teaching experience or

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[11] United States Navy Department, Bureau of Naval Personnel, Training Aids Division, "United States Naval Administration in World War II: Bureau of Naval Personnel Training Activity," (manuscript on file in the Office of Naval History, Navy Department, Washington, /n.d./), III, 1.

training for teaching. Obviously these new instructors were also unfamiliar with much of the content they were called upon to teach.[12] In view of this, it is not surprising that early surveys showed the distribution and utilization of early training films in the Navy to be most unsatisfactory. It was found in 1942 that half (forty-nine per cent) of the schools were using films poorly, and a fourth (twenty-four per cent) were not using them at all. Of 7,000 instructors in 186 schools surveyed, less than thirty per cent were reported to have been using any audio-visual aids to help them teach. On the other hand, ninety-seven per cent of the officers contacted were favorable to the use of films and seventy-nine per cent of them asked for help from the Training Film Unit.[13] This survey led to the decentralization program with central libraries established in the ten Navy districts and at various overseas bases from which the fleet and advanced units could draw films and devices.

The establishment of these central and sub-libraries greatly alleviated much of the distribution problem, but this step alone could not guarantee either their efficient functioning or their proper use by nearby schools, bases, or ships. It became apparent that official coördination

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[12] Loc. cit.

[13] United States Navy Department, Bureau of Naval Personnel, "Audio-Visual Aids Board Survey."

through officers trained in distribution and utilization procedures was essential to the best operation and use of these libraries, and a Naval headquarters agency was specifically established for that purpose. Some two hundred utilization and evaluation officers were commissioned for and trained by the Utilization and Evaluation Section of the Training Aids Division of the Bureau of Naval Personnel to assist officers of the forces afloat and ashore in procuring and using available aids in the training program. These officers visited the various bases, training commands, and ships entering port to assist the training officers in the solution of their training problems. The Special Devices Division, as pointed out previously, also had many officers in the field to assist in the installation and maintenance of devices and to give needed advice on the purposes, uses, and limitations of the equipment. These officers collected considerable evidence on the distribution, extent of use, and need for training aids, although less research was done to establish the comparative effectiveness of particular types of training aids. Although formal investigations of effectiveness are almost totally lacking, the point of view encountered among most educators, service and otherwise, is that these aids were a major means of training the men who won World War II.[14]

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[14] Miles and Spain, op. cit., p. 59.

# CHAPTER III

## SUMMARY OF THE FLIGHT TRAINING SYLLABUS

The flight training syllabus of the Navy is in a constant state of change and revision. This is necessarily so because of the ever-changing nature of the field of aeronautics. The flight training program, if it is to be effective, must produce pilots who are not only capable of flying the complex aircraft which are produced today but are also able to grasp quickly and to utilize effectively the new developments which are occurring so rapidly in the realm of aviation. The syllabus which is discussed in this chapter is that which was in effect as of March 1, 1957. No attempt will be made here to discuss individually the subjects which are taught, but a brief summary of the training for each phase will be given in tabular form.

### I. PRE-FLIGHT TRAINING

All students entering the flight training program are sent to the U.S. Naval School, Pre-Flight, located at the Naval Air Station, Pensacola, Florida. The course of instruction for all Naval Aviation Cadets is fifteen weeks. There is a shorter course--of six weeks duration--for Naval and Marine officer students, but since this is merely a condensed version of the fifteen week course, and since the

majority of flight students in the Navy are cadets, the short course will not be discussed here.

One of the purposes of the U.S. Naval School, Pre-Flight, is to provide Naval Aviation Cadets with a background of Naval knowledge and training required for prospective Naval officers, and to prepare them for flight training through a correlation of ground training and practical work. The fifteen week course of instruction consists of 395 periods in ten different subject areas totaling 535 hours. A summary of this syllabus, showing subject matter taught and length of time devoted to each course, is shown in Table I. It is interesting to note that more time is devoted to navigation than to any other subject in Pre-Flight. To men who must fly great distances over open water--often in bad weather--and then locate and land aboard an aircraft carrier, such training cannot be overstressed.

## II. BASIC TRAINING

After the completion of Pre-Flight Training, the student aviator is then assigned to Basic Training. All of the Navy basic flight training is conducted at fields in the Pensacola, Florida, area. Primary training is conducted at Saufley Field. Here, for a period of eight weeks, the student flies a total of 48.75 hours in pre-solo, precision, and acrobatic stages of flight in the T-34 "Mentor" training aircraft. In addition, he attends ground school for

## TABLE I

## SUBJECTS TAUGHT TO NAVAL AVIATION CADETS AND LENGTH OF TIME DEVOTED TO EACH SUBJECT AT U. S. NAVAL SCHOOL, PRE-FLIGHT

| Subject | Periods | Hours |
|---|---|---|
| Aerology | 25 | 25.0 |
| Character Guidance | 6 | 6.0 |
| Engineering | 47 | 47.0 |
| Flight Physiology | 1 | 1.0 |
| Military | 63 | 94.5 |
| Naval Orientation | 54 | 54.0 |
| Navigation | 66 | 132.0 |
| Physical Fitness and Survival | 85 | 127.5 |
| Principles of Flight | 25 | 25.0 |
| Study Skills | 23 | 23.0 |
| Totals | 395 | 535.0 |

eighty-nine periods totaling 104.5 hours. He is also given flight support lectures--lectures on how to fly the aircraft--for thirty and one-half hours. A summary of this primary phase instruction is given in Table II.

While he is still in primary training, the student decides which type of aircraft he wishes to fly in Advanced Training, and his choice determines the course of instruction he will be given through the rest of Basic Training. If he wishes to fly fighter or attack aircraft later in his training, he will proceed to Whiting Field, and for eighteen weeks he will fly the T-28 "Trojan," a heavier and more powerful single-engine trainer. The fighter and attack training includes radio instruments, acrobatics, tactics, navigation, and night flying. This phase consists of fifty-five flights totaling 77.25 hours. A summary of the ground school courses taught in this phase is given in Table III.

After completing the fighter and attack phase at Whiting Field, the student is then sent to Barin Field for bombing, gunnery, and carrier qualification training. Here, for a period of five weeks, he practices aerial gunnery, bombing, and carrier approaches. The culmination of this training occurs when the student Naval aviator actually makes six landings aboard an aircraft carrier cruising in the Gulf of Mexico. In this, the final flight phase of Basic Training, the student completes twenty-nine flights

## TABLE II

## SUBJECTS TAUGHT IN PRIMARY PHASE GROUND SCHOOL AND LENGTH OF TIME DEVOTED TO EACH SUBJECT

Academic

| Subject | Periods | | Hours |
|---|---|---|---|
| Naval Leadership . . . . | 10 | | 10.0 |
| Indoctrination . . . . . | 3 | | 3.5 |
| Communications . . . . . | 37 | | 37.0 |
| Engineering . . . . . . . . | 10 | | 10.0 |
| Navigation . . . . . . . . | 15 | | 30.0 |
| Military . . . . . . . . . | | (2 hours per week) | |
| Physical Fitness-Survival | | (3 hours per week) | |
| Recognition . . . . . . . . | 10 | | 10.0 |
| Synthetic Flight . . . . | 4 | | 4.0 |
| Totals (Minus Military and Physical Fitness) | 89 | | 104.5 |

Flight Support

| Subject | Periods | Hours |
|---|---|---|
| Flight Procedures . . . . | 16 | 18.5 |
| Flight Briefing . . . . . | 24 | 12.0 |
| Totals | 40 | 30.5 |

## TABLE III

## SUBJECTS TAUGHT IN FIGHTER AND ATTACK TRAINING PHASE AND LENGTH OF TIME DEVOTED TO EACH SUBJECT

Academic

| Subject | Periods | Hours |
|---|---|---|
| Indoctrination . . . . . . | 3 | 3.0 |
| Communications . . . . . . | 22 | 23.0 |
| Engineering . . . . . . . . | 10 | 10.0 |
| Safety . . . . . . . . . . | 2 | 2.0 |
| Military . . . . . . . . . | 20 | 20.0 |
| Physical Fitness-Survival | 22 | 26.5 |
| Aerology . . . . . . . . . | 28 | 28.0 |
| Civil Air Regulations . . | 4 | 4.0 |
| Flight Physiology . . . . | 7 | 10.0 |
| Navigation . . . . . . . . | 5 | 10.0 |
| Totals | 123 | 136.5 |

Flight Support

| Subject | Periods | Hours |
|---|---|---|
| Flight Procedures . . . . | 31 | 37.5 |
| Flight Briefing . . . . . . | 60 | 24.5 |
| Link Trainer . . . . . . . | 10 | 12.5 |
| Totals | 101 | 74.5 |

totaling 19.5 hours. The ground school given in this phase is summarized in Table IV.

Fifty-six per cent of all flight students completing the primary phase of Basic Training are billeted for fighter and attack training. The other forty-four per cent, who will fly patrol and anti-submarine aircraft, receive slightly different training through the rest of their Basic Training. After completing the primary phase, the future patrol or anti-submarine pilot is sent to Corry Field, where he is trained in the SNJ "Texan," a single-engine trainer, and in the SNB, a twin-engined Beechcraft, for a period of sixteen weeks. He then proceeds to Barin Field, where he is trained for eight weeks in radio instruments and day and night navigation. The regular Navy students also receive carrier qualification training and land aboard an aircraft carrier during this phase. Figure 1 shows graphically the path which the student aviator from each group will follow as he proceeds through Basic Training.

After the completion of the flight phase of Basic Training, all students are sent to a supplementary ground school where they study navigation and flight physiology for thirty-two hours. By the time the student completes Basic Training, he has completed at least 122 flights and has a minimum of 155.5 hours of flight time. His ground school training has required 693 periods of instruction totaling

## TABLE IV

## SUBJECTS TAUGHT IN GUNNERY AND CARRIER QUALIFICATION PHASE AND LENGTH OF TIME DEVOTED TO EACH SUBJECT

Academic

| Subject | Periods | Hours |
|---|---|---|
| Atomic, Biological, and Chemical Warfare . . . . | 6 | 7.0 |
| Communications . . . . . | 22 | 22.0 |
| Military . . . . . . . . . | 12 | 12.0 |
| Physical Fitness-Survival | 18 | 18.0 |
| Navigation . . . . . . . . | 5 | 10.0 |
| Gunnery . . . . . . . . . . | 7 | 8.5 |
| Carrier Indoctrination . | 1 | 3.0 |
| Totals | 71 | 80.5 |

Flight Support

| Subject | Periods | Hours |
|---|---|---|
| Flight Procedures | 15 | 20.0 |
| Flight Briefing | 28 | 15.0 |
| Totals | 43 | 35.0 |

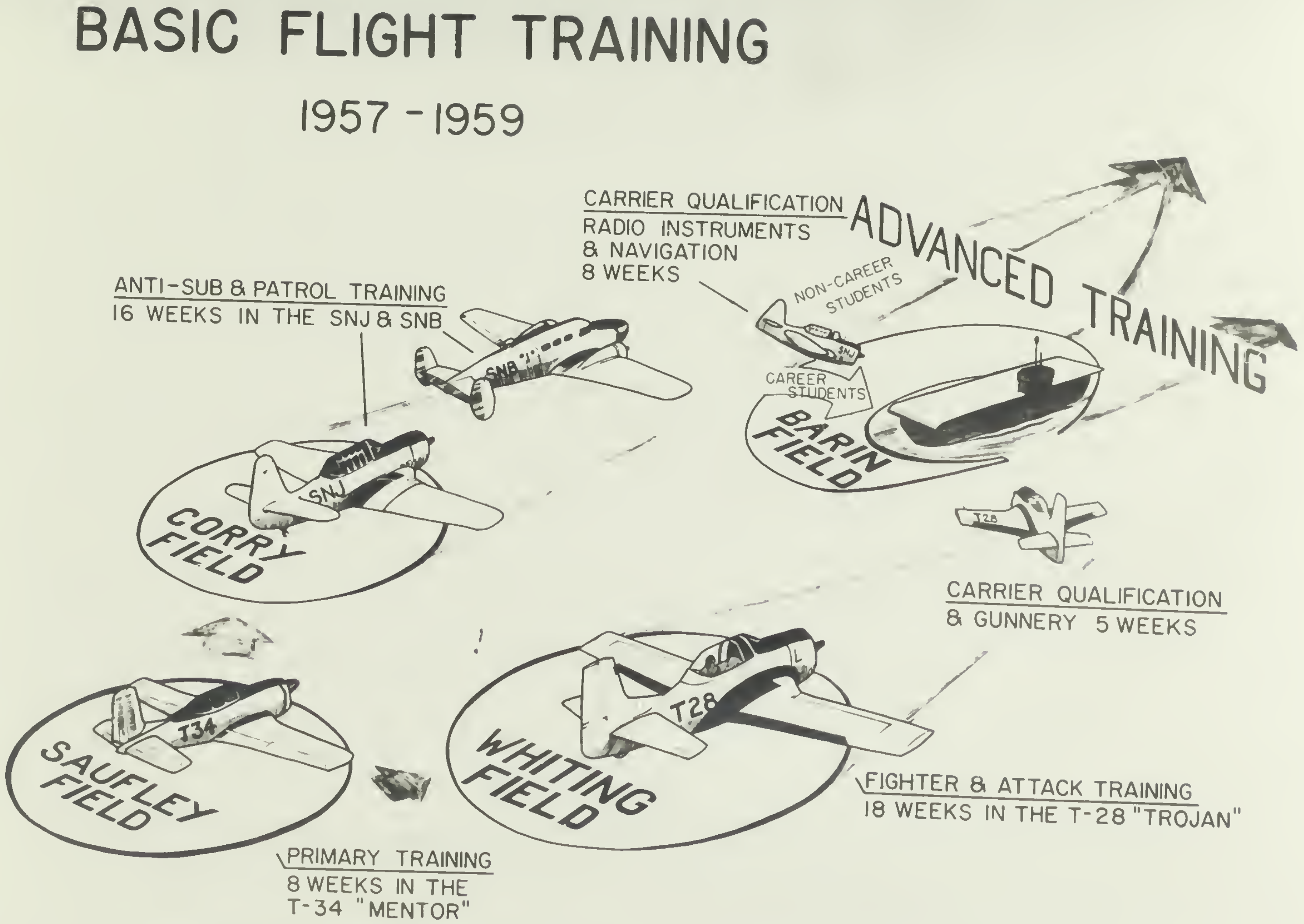
BASIC FLIGHT TRAINING
1957 - 1959
ANTI-SUB & PATROL TRAINING
16 WEEKS IN THE SNJ & SNB
SNB
SNJ
CORRY FIELD
CARRIER QUALIFICATION
RADIO INSTRUMENTS
& NAVIGATION
8 WEEKS
NON-CAREER STUDENTS
CAREER STUDENTS
SNJ
BARIN FIELD
ADVANCED TRAINING
T28
CARRIER QUALIFICATION
& GUNNERY 5 WEEKS
T34
SAUFLEY FIELD
T28
WHITING FIELD
FIGHTER & ATTACK TRAINING
18 WEEKS IN THE T-28 "TROJAN"
PRIMARY TRAINING
8 WEEKS IN THE
T-34 "MENTOR"

Figure 1. Courses of flight instruction in Basic Training.

871 hours. In addition to this, flight support lectures have accounted for 195 periods and 157 hours.

## III. ADVANCED TRAINING

In Advanced Training, the student flies the same type aircraft which he will fly when he joins a fleet squadron. The type of training he receives during this stage will depend upon the course he completed in Basic Training. If he followed the patrol syllabus through Basic Training, the student will go to the Naval Air Station, Hutchinson, Kansas, where he will fly the P2V "Neptune," a twin-engined, land-based patrol plane or to the Naval Air Station, Corpus Christi, Texas, to be trained in the PBM "Mariner," a twin-engined seaplane. Anti-submarine pilots are sent to the Naval Auxiliary Air Station at Kingsville, Texas, and fly the S2F "Tracker," a twin-engined anti-submarine aircraft. Fighter pilots receive jet training at Chase Field, near Corpus Christi. The pilots who will receive attack training are sent to Cabaniss Field, also near Corpus Christi, where they fly the AD "Skyraider."

All of these programs will differ somewhat because of the varying nature of the training, but the students in all four groups will fly about 150 hours in Advanced Training and will attend ground school for approximately the same length of time. A summary of the ground school training for the attack phase is given in Table V.

## TABLE V

## SUBJECTS TAUGHT IN ATTACK PHASE, ADVANCED TRAINING, AND LENGTH OF TIME DEVOTED TO EACH SUBJECT

Academic

| Subject | Periods | Hours |
|---|---|---|
| Indoctrination . . . . . | 5 | 5.0 |
| Civil Air Regulations . . | 3 | 3.0 |
| Navigation . . . . . . . . | 21 | 21.0 |
| Aerology . . . . . . . . . | 16 | 16.0 |
| Engineering . . . . . . . . | 25 | 25.0 |
| Survival . . . . . . . . . | 8 | 8.0 |
| Amphibious Warfare . . . | 6 | 6.0 |
| Aerial Mine Warfare . . . | 5 | 5.0 |
| Communications . . . . . | 9 | 9.0 |
| Electronics . . . . . . . . | 11 | 11.0 |
| Gunnery . . . . . . . . . . | 15 | 15.0 |
| Anti-submarine Warfare . | 8 | 8.0 |
| Naval Orientation . . . . | 9 | 9.0 |
| Totals | 141 | 141.0 |

Flight Support

| Subject | Periods | Hours |
|---|---|---|
| Flight Procedures . . . . | 44 | 44.0 |
| Flight Briefing . . . . . | 84 | 114.5 |
| Synthetic Trainer . . . . | 19 | 26.0 |
| Flight Physiology . . . . | 13 | 13.5 |
| Totals | 160 | 198.0 |

By the time he has completed the flight training program and is designated a Naval aviator, the student has amassed slightly more than three hundred hours of pilot time. His academic course of instruction has consisted of 834 periods requiring 1,012 hours. 355 flight support lectures, totaling 355 hours, also have been attended.

In addition to the flight training in conventional aircraft described previously, the Navy also conducts flight training in airships and in helicopters. Although both of these activities are actually advanced training, they are under the command of the Naval Air Basic Training Command. In addition to the unique type of training involved, airship and helicopter training differs from the other training commands in that veteran aviators as well as newly-designated pilots are trained in these activities.

## CHAPTER IV

## MOTION PICTURES AND OTHER TRAINING AIDS USED IN THE FLIGHT TRAINING SYLLABUS

The use of motion pictures, which was quite limited in the flight training program prior to World War II, has grown in importance until it is now one of the primary means of instructing student aviators. At the time this survey was conducted, there were 112 different films used in the flight training program. This is the number actually listed as syllabus films in the syllabi of the various stages of training. There are possibly an equal number of other films which are used although not listed in the syllabus.

There is no phase of the training program in which films and other audio-visual aids are not utilized. In this chapter, the training program has been classified into eight subject areas, and the motion pictures and other training aids used in each of the subject areas are discussed.

Aerology. Since all aviators who complete the flight training program must qualify for and maintain an instrument rating, the study of weather and how it affects aircraft is of vital importance. The "Aerology" series--eight animated films produced by Walt Disney for the Navy--are used in several different stages of the sixty-nine hours of training the student receives in aerology. These films, although

produced in 1943 and 1944, are still among the best films on the subject of weather available today. This is true because, although new developments are constantly occurring in this field, the basic principles underlying weather phenomena do not change. These films, seven of which are in color, present and discuss such subjects as ice formation on aircraft, the theory of fog formation and conditions conducive to its formation, warm and cold fronts and the dangerous weather associated with each, cloud formations, and flight planning through and around weather conditions. Color, as used in this series of films, is a completely functional matter. Different elements of the weather picture, which might easily become confused in a black-and-white film, are given different colors to aid in distinguishing them, thus maintaining clarity and insuring the effectiveness of the films.

Another series of films, produced by the Navy in 1953 and 1954, is used to introduce to the students the problems involved in flying in bad weather. One of the most dangerous obstacles to flight--the thunderstorm--is presented, and flight techniques associated with thunderstorm penetration are shown. Atmospheric stability and instability are explained, and the causes of vertical air currents and their relationship to changes in the weather are shown.

In addition to the syllabus films on aerology, many other training aids are also used in this area. Mockups of

many of the items of equipment used by the aerologists are utilized in the classroom to teach principles of weather forecasting. Three-dimensional graphics are used to point out the different types of weather associated with cold fronts, warm fronts, and occluded fronts. Plastic containers--much like large fish bowls--containing different colored fluids of varying temperatures, are used to show what happens when different air masses come together.

Engineering. Engineering, as it is taught in the Naval aviation training program, presupposes no previous knowledge on the part of the student other than a basic grasp of elementary physics. In the ninety-two hours devoted to this subject in the flight training program, the student learns the principles of internal combustion engines, basic electricity and magneto ignition, hydraulics, propeller construction and operation, and jet engine operation. Training films on each of these subjects are utilized to assist the instructors in teaching. After learning the basic fundamentals of aircraft engineering, the student then studies in detail the engineering features of the various types of aircraft as he flies them throughout the program.

Training aids are used extensively in this phase of flight training. Cut-aways are used to show the relationship of various parts of the engines. Figure 2, a typical example of such a cut-away, shows two students examining a

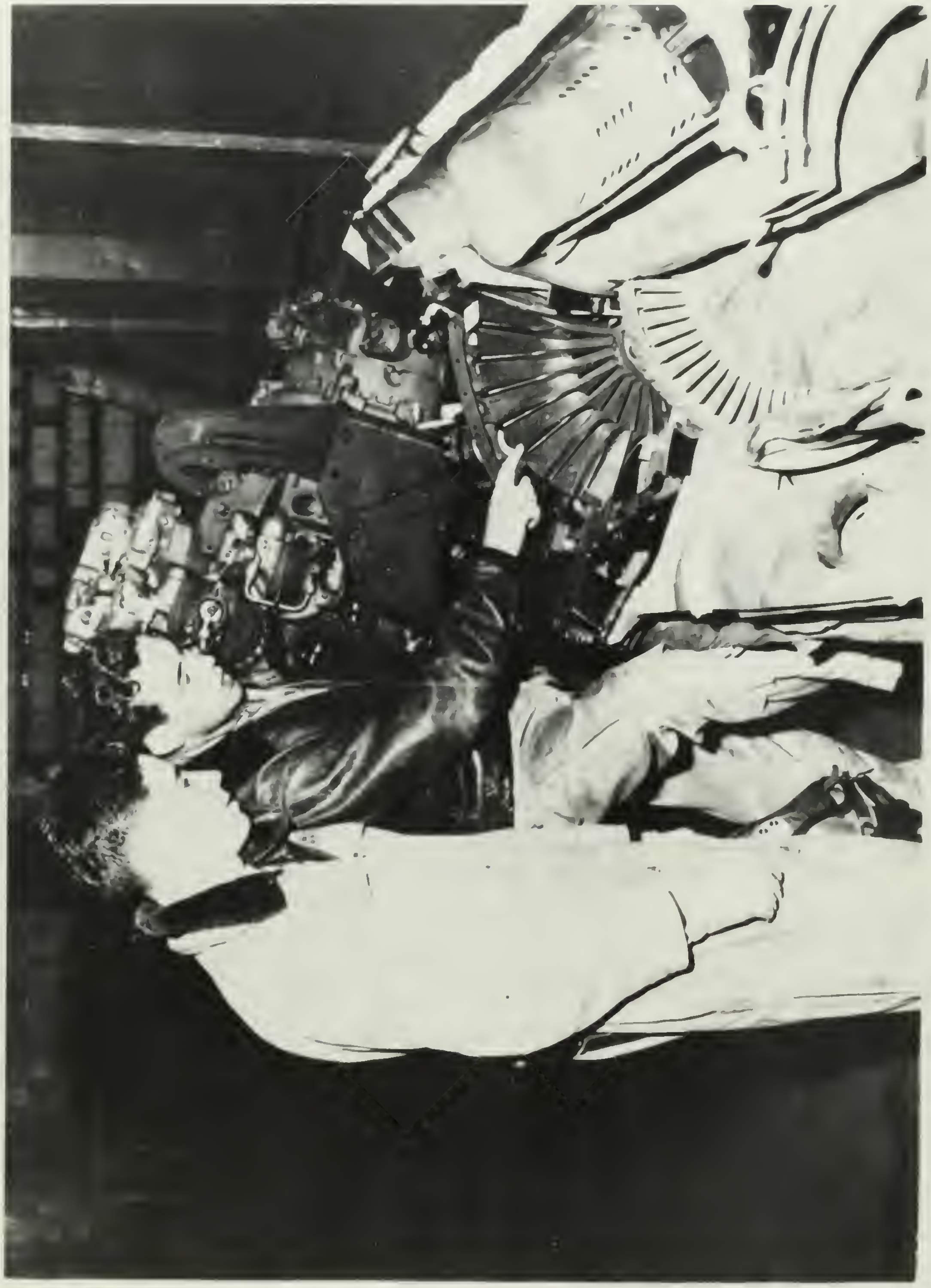

Figure 2. Students examining cut-away of J-31 jet engine.

J-31 jet engine. The engine has been dissected so that all of the component parts are visible, thus making it much easier to understand the functions and operation of all the various parts. Many of the cut-aways used by the Navy are electrically operated, adding even more to the effectiveness of the training aid. Engine "test-stands" are also used to train students. Here, an engine is removed from the aircraft and mounted in a metal framework. In addition to starting, operating, and stopping the engine, the student is given the opportunity to diagnose and correct malfunctions of the engine which were purposely introduced by the instructor.

The field of aircraft engineering has proved ideal for the use of mockups. The subject matter to be discussed is stripped of all material which is nonessential to the teaching problem at hand. The student is able to devote his full attention to what is being taught, and the time required to learn the material is considerably shortened. Figure 3 is a mockup of an aircraft hydraulic system. The components of this system are actually spread out from one end of the aircraft to the other. For purposes of teaching, however, the system is condensed and simplified, although all the basic parts of the original are retained in the mockup.

Large-scale models of items such as carburetors are used to show detail to a large class when such detail could

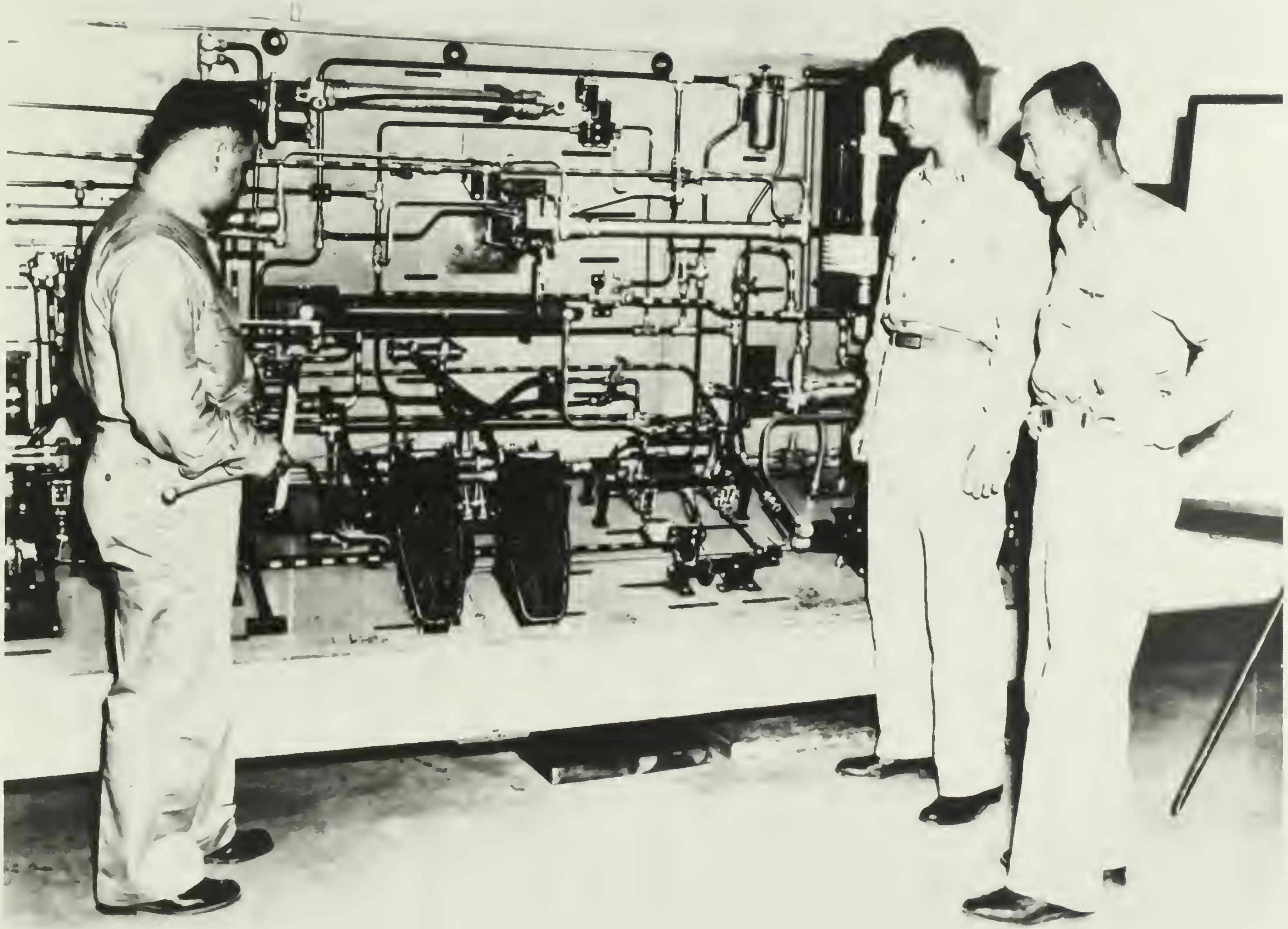

Figure 3. Instructor using mockup to explain aircraft hydraulic system.

not be seen on the original. Pictures and schematic drawings are also used to simplify the teaching of complex material.

Naval Orientation. The purpose of Naval Orientation, as the name implies, is to acquaint the student with the Navy. Since many students enter the flight training program directly from civilian life without any military background whatsoever, considerable time must be devoted to teaching these men the duties, obligations, and responsibilities they must face as Naval officers. Films on Naval history and Naval customs, personnel classification and administration, the Naval establishment, military security, and others of the same nature are used to assist the instructor in teaching basic Naval indoctrination. Several films on the Uniform Code of Military Justice are used.

The history of Naval aviation, its part in World War II, and its present-day role are all depicted through the use of films. Since the student can expect to spend some time aboard ship during his Naval career, shipboard orientation and organization are discussed and shown on film.

Although a total of fifteen syllabus films are shown during the seventy-three hours devoted to Naval orientation, relatively few audio-visual aids are used in conjunction with the films and classroom lectures. Undoubtedly, the primary reason for this is that the subject matter does not

lend itself to audio-visual presentation--except for films--as well as most of the other material taught in the flight training program.

In certain areas of the subject, however, audio-visual aids have been used with great success. Large, clear plastic models of various Naval vessels are used to show the student the various parts of the ship, what activities occur there, and how the different spaces aboard ship are numbered. Filmstrips are used to explain the service obligation which each student has and what part his present Naval service plays in fulfilling that obligation.

Principles of flight. How an airplane flies is important information which every would-be aviator must understand thoroughly before he attempts to learn to fly. A total of twenty-five hours is devoted to this subject in the Navy's flight training program. This subject is concerned only with the aerodynamic principles of flight--many more hours are spent discussing specific flight maneuvers and situations in flight procedures and in flight briefings.

The films used in this area are integrated closely with classroom lectures and with other audio-visual aids to instruction. Lift, drag, thrust, and the pull of gravity are all shown on film. The factors affecting stability of the aircraft and the manner in which the plane is controlled are presented by the use of motion pictures. The different

types of propellers, their design, and theory of operation are presented visually. Aeronautical maneuvers, stalls and spins, and recovery procedures are discussed. High speed flight and compressibility effects on aircraft are also included in the subject matter of the seven films on principles of flight.

Models are used extensively in this course to demonstrate the effects of the various flight phenomena on aircraft. Cut-aways and mockups are used to show the details and type of construction of aircraft fuselages, wings, control surfaces, empennage, floats, and other components. Graphic materials, charts, and large drawings are used to show visually the results of these various aerodynamic factors.

Survival. As long as there are aircraft flying, there will always be accidents and airmen who must be rescued. This statement explains the emphasis which is placed upon survival training. No aviator knows when he may be forced down at sea, in the jungles, or on the frozen tundra of the arctic. His very life, in these and in many other situations, may depend upon how well he has learned his lessons in survival.

There is a total of eight syllabus training films on the subject of survival. These films show the student the proper use of the aircraft safety harness, how to use a

parachute when bailing out of an aircraft, and how to care for a chute properly. The varied and numerous items of rescue equipment used by the Navy are shown in different films, and their use is described--both in simple how-to-do-it steps and in hypothetical situations. The steps a pilot must take when forced down are shown as if they actually happen. The actions a pilot can take to make himself more visible from the air and the factors affecting visibility are shown. Making seawater drinkable--a subject of great importance to pilots who fly over open water--is shown in detail.

Practically no audio-visual aids, except for the eight films on the subject, are used on the subject of survival. The reason for this is that the actual equipment itself is available. Students are taught the proper procedures for being rescued by a helicopter by actually having a helicopter pick them up out of the water. This is considered good training because almost all pilots--after having ditched an aircraft in the water--are in varying stages of shock and must know then the right steps to take if they are to be rescued. Technique in inflating and entering a life raft is demonstrated and practiced in the water. The use of rescue equipment, after having been shown on film, is made more meaningful to the student by having him actually operate the equipment.

There are two notable training aids in the field of

survival, however. One of these is the ballout trainer. In this device, the student proceeds with the steps he would actually take if he were bailing out of a real aircraft. The other training aid is the "Dilbert Dunker," a device in which the student is taught to free himself from an upside-down aircraft after he has ditched in the water.

Gunnery. The gunnery and bombing phase of flight training ranks among the most enjoyable phases of instruction with a large majority of flight students. This may be because the student is aware that here is one of the main reasons why he is undergoing all this exacting training. Or it may be that he responds to the feeling of competition with other students in the accuracy of his gunnery and bombing runs.

Before the student begins to fire from his aircraft, however, he is taught the fundamentals and techniques of gunnery through classroom lectures, motion pictures, and other training aids. The operation of the equipment which he will use, such as the .50 caliber machine gun and the Mark 8 illuminated gun sight, is shown in great detail in training films. The basic concepts of dive bombing, drift and deflection correction, and the relative motion problems involved when attacking a moving target are all presented by the five motion pictures used in this stage of the training program.

Cut-aways of guns, bombs, and rockets are used to explain the workings of these items more clearly to the student. Mockups of firing and releasing mechanisms are also used. Models are used to demonstrate the problems of relative motion and to describe the various types of gunnery and bombing runs. Figure 4 shows an instructor demonstrating proper dive bombing procedure with the bombing run demonstrator, a three-dimensional, electrically operated training device.

Navigation. More time is devoted to the teaching of navigation than to any other academic subject in the flight training program. The complete syllabus requires 112 periods totaling 203 hours in navigation. The student must master dead reckoning, radio navigation, celestial navigation, and navigation by various electronic means before he completes his flight training.

Nine syllabus films are used in teaching navigation. These films show what the various aids to navigation are and how they are used. Aerial charts and aerial map reading are discussed in detail, and the techniques of dead reckoning are visualized and explained. The Mark 3A plotting board is shown, and the methods involved in operating it are discussed. Aircraft navigational procedures are shown on film so that the student may tie together all the information to which he is being exposed.

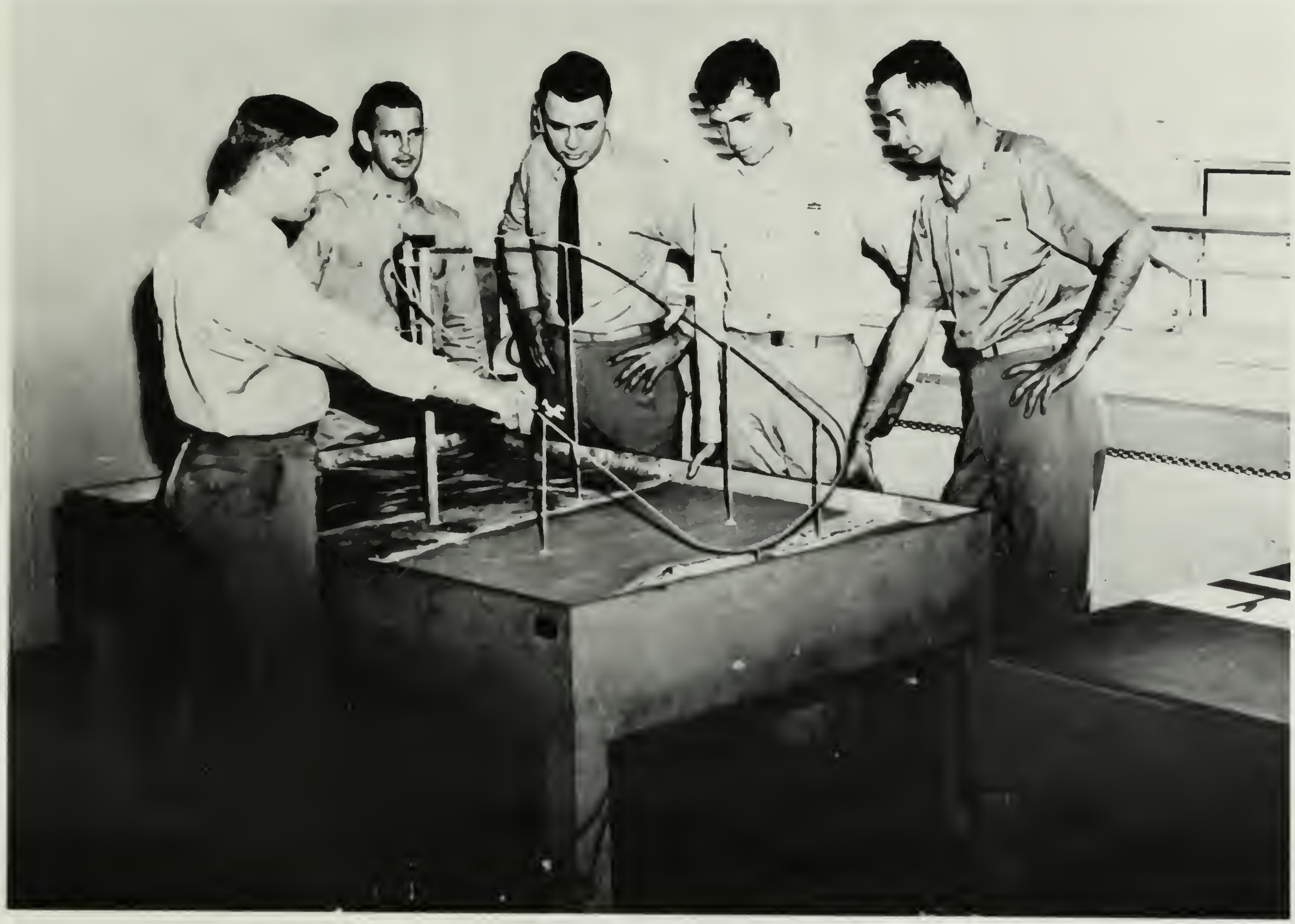

Figure 4. Instructor explaining principles of bombing with bombing-run demonstrator.

Many training aids are being used in conjunction with the lectures and films. Large-scale models of the computers and plotting boards are utilized in the classroom to simplify discussions of the uses of this equipment. Models and mockups of sextants are used to explain the workings of this instrument to the student. Charts and pictures help to explain the use of the various navigational forms and publications which are used. Graphic materials are used to explain bearings and courses which might quickly become confusing if completely verbalized. Figure 5 shows an instructor explaining the use of the omnirange to two students.

One of the largest synthetic training devices used by the Navy is the Link Celestial Navigational Trainer. This trainer, which is usually a complete building in itself, is somewhat like a planetarium. The celestial bodies actually move, enabling the student to "shoot the stars" with a bubble sextant and plot his position just as if he were flying over the Pacific or Atlantic oceans.

Flight Procedures. In every flying phase throughout the entire flight training program, the student is taught flight procedures. These lectures and films are closely related to the actual control of the aircraft. Since it would be far too costly and time consuming for the instructor to teach procedures in the air, this is done on the ground before take off, leaving the instructor free to concentrate on teaching technique while actually airborne.

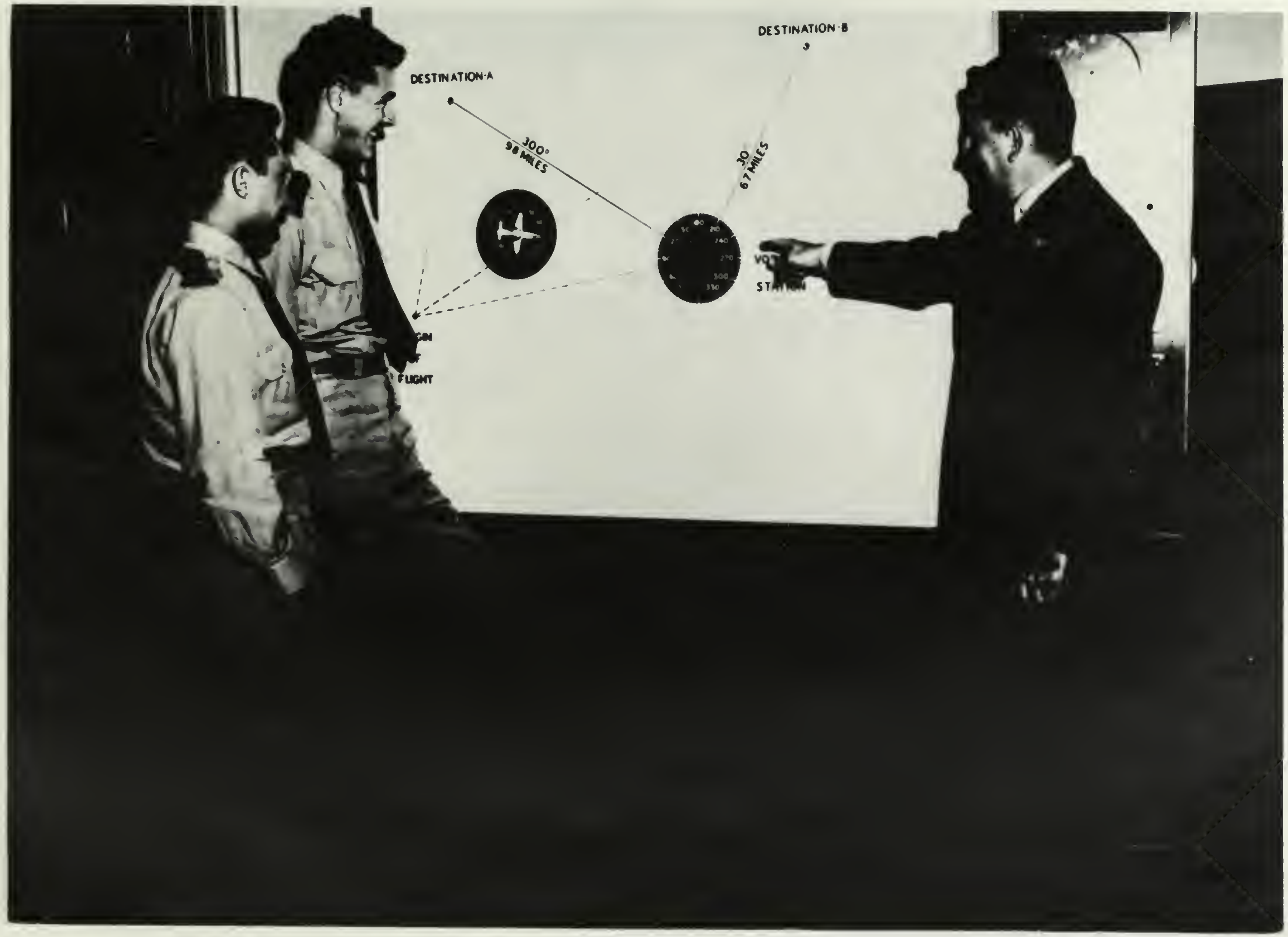
DESTINATION-A
300°
98 MILES
DESTINATION-B
30
67 MILES
FLIGHT

Figure 5. Instructor explaining use of omnirange.

Films are used extensively to teach flight procedures. At several stages during his training, the student is introduced to the new type of aircraft he will fly, through the use of motion pictures. The proper taxiing procedure and use of brakes is shown in the early stages. The maneuvers which the student will perform in the air are discussed and presented on film. Precision flying, emergency procedures, acrobatics, carrier landing procedures, and carrier landing signals are all shown in this manner. Instrument procedures and ground-controlled-approaches are also included in the eighteen flight procedure films.

Models are used extensively in flight procedure training--especially in showing flight maneuvers in three dimensions. Mockups of the pilot's compartment and control panels of several different types of aircraft are used to give the pilot an intimate acquaintance with the type of aircraft he will fly.

Since things look different from the air, and since there are many training aircraft using the same field at the same time, student pilots must be thoroughly briefed on the procedures for leaving and entering the traffic patterns of all of the fields where training is conducted. Charts are often used to present this information to the student. Figure 6 shows an instructor briefing a student on the landing pattern to be employed.

Several different types of flight simulators are

Figure 6. Instructor briefing student on landing pattern.

utilized in teaching flight procedures to the student. The link trainer, shown in Figure 7, is a mockup of a cockpit. This trainer, completely enclosed, has a full set of flight instruments and responds to the control movements of the pilot in almost the same manner as would an actual aircraft. The link trainer has proved invaluable in teaching instrument flight procedures. Operational flight trainers, which are also used in teaching flight procedures, are much larger than a link trainer. They may be a mockup of a complete pilot's compartment, and pilot, co-pilot, and flight engineer may all be trained at the same time. The simulated flight given by these trainers becomes quite real to the students who are being trained.

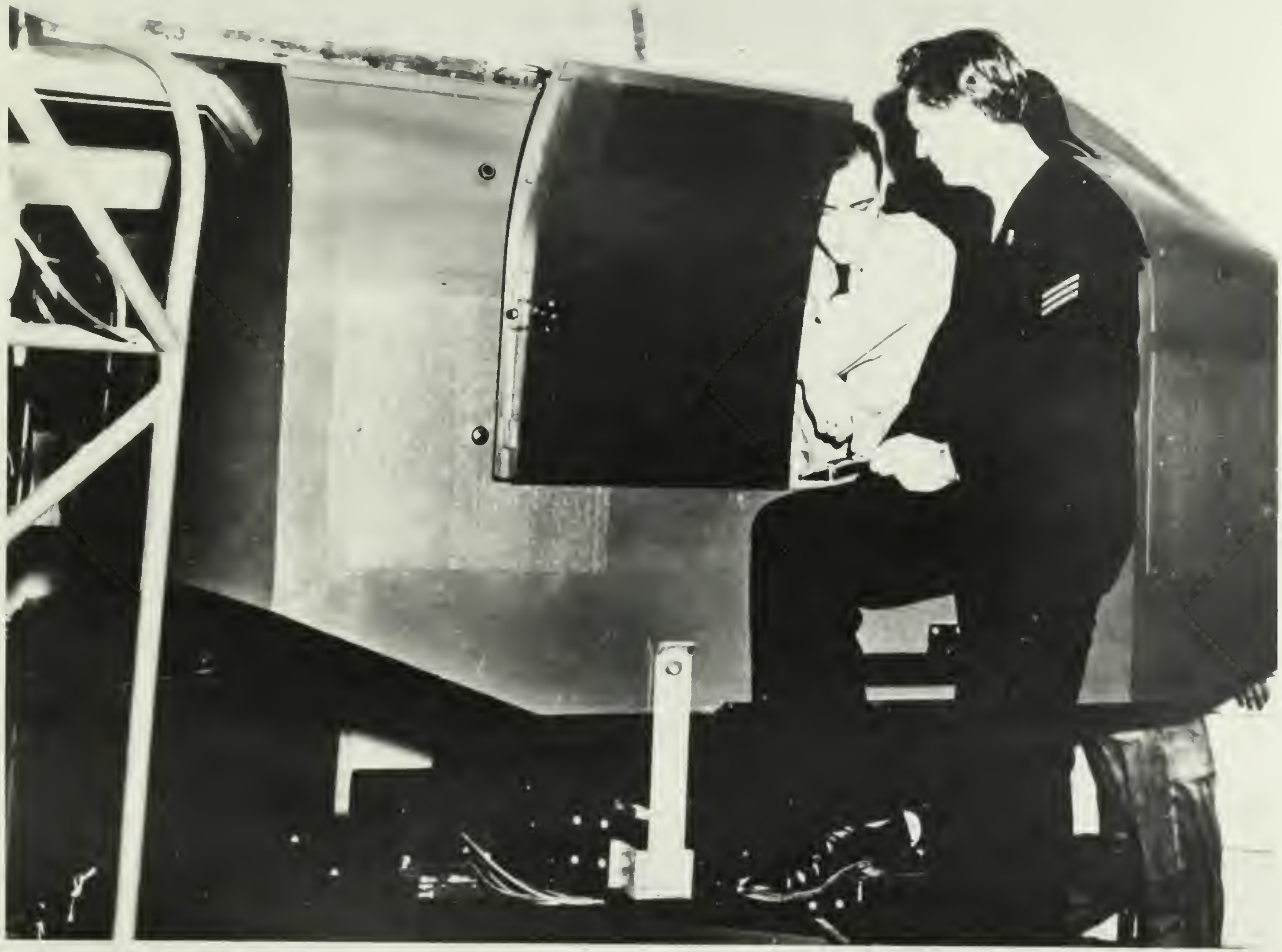

Figure 7. Instructor briefing student on instrument flight procedures in link trainer.

## CHAPTER V

## MOTION PICTURES AND FLIGHT TRAINING PROBLEMS

There are several major problems which are continuously encountered by the Navy in its efforts to train pilots. One of these is the cost--both in time and in money--of producing a well-trained aviator. Another serious problem is the apparent lessening of the motivation to fly on the part of the youth of America. Still another difficulty which must be faced is the need to maintain high standards of safety in a training program which is inherently dangerous. These problems--and the part which motion pictures play in helping to solve them--is of vital importance to the success of the Naval aviation training program.

*Costs of training: time and money*. The costs of training a pilot have continued to soar since World War II. Just as the aircraft of today have increased in complexity, so has the nature of the training which the pilots must receive in order to fly them. At the present time, an expenditure of $60,000 per year is required for each student undergoing flight training.[1] With this large amount of money being spent on every student, the training program is

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[1] Naval Air Training Command, *Training Your Air Navy* (Pensacola, Florida: U. S. Naval Air Station, 1956), p. 36.

under constant analysis to improve the quality of the training and to reduce the money and time expended.

It is obviously impossible to teach students to fly by the use of motion pictures and other audio-visual training aids alone. There are certain motor skills involved in flying an aircraft which can be learned only by operating the controls of the aircraft. Many of these motor skills can be learned much more quickly in flight, however, if the student is given a program of coördinated training on the ground which is directed toward preparing him to learn these skills in the air. Instrument flying, for example, is a skill which very few pilots possess--except military and airline pilots. Practice in instrument flying is costly and something which the average pilot cannot afford. The instrument training programs in the Navy are a combination of lectures, films, audio-visual aids, and actual flight practice. The principles and procedures of instrument flying are given to the students by lectures, and this information is reenforced and expanded by the use of audio-visual aids. Then the student is given an opportunity to "fly" the link trainer. In this synthetic device, he not only increases his understanding of instrument flight procedures, but he also acquires some of the basic motor skills necessary in flying an aircraft without any outside visual reference. By the time he actually enters an aircraft to practice instrument flying, the student has learned enough about

the subject to enable him to master this skill in a fraction of the time that would have been required had he not been given prior training.

Motion pictures are also used to teach many other motor skills which are necessary in flying. Flight procedures in all phases of the program are taught with the aid of films which show the student how to perform the maneuvers. One of the techniques employed in teaching skills of this type--which has been verified by results obtained from the Instructional Film Research Program--is the "subjective" placing of the camera.[2] If the performance is shown on the screen the way the learner would see it if he were actually performing the maneuver himself, the film will be more effective than if the camera angle is from the point of view of the observer.

The techniques of landing and of taking off are shown in this manner, and emergency procedures are also presented visually to the student. Training students on the ground is less expensive and much less dangerous, as well as less time-consuming, than the same training which is given in the air.

The actual physical control of the aircraft, however,

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[2] Sol M. Roshan, *Effects of Learner Representation in Film-Mediated Perceptual-Motor Learning* (Technical Report SDC 269-7-5, Instructional Film Research Program; State College, Pennsylvania: Pennsylvania State College, 1949).

is only one of the many things a pilot must learn. He must master this, of course, if he is to be entrusted with the responsibility of equipment worth perhaps several million dollars and the lives of others who must fly with him. But he must also master and maintain a working knowledge of all the other subjects which have been discussed previously.

There is a great deal of factual information which the prospective pilot and Naval officer must learn and retain throughout his Naval career. Films can be used to great advantage in teaching this factual information, leaving the instructor free to concentrate on other areas of study.[3] Much time can often be saved in this manner.

Although training films, if utilized properly, can result in a substantial saving of both time and money, the cost of such films often runs into a considerable figure. At the present time, the cost of producing a training film is approximately one thousand dollars per minute of running time.[4] It is obvious that, under these conditions, motion pictures cannot be inserted indiscriminately into the aviation training program. A determination must first be made

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[3] Abram W. VanderMeer, Relative Effectiveness of Instruction by: Films Exclusively, Films Plus Study Guide, and Standard Lecture Methods (Technical Report SDC 269-7-13, Instructional Film Research Program; State College: Pennsylvania State College, 1950).

[4] "Some Notes on Training Films," Naval Training Bulletin, Bureau of Naval Personnel (Washington: Government Printing Office, January, 1957) p. 15.

as to whether or not films can be used to teach the particular subjects under consideration more effectively than other methods of instruction, and if so, does the increase in efficiency of learning warrant the expenditure which must be made for the film.

The Instructional Film Research Program, which is investigating the effective production and utilization of training films, has reached conclusions which are quite applicable to some of the problems of training student aviators. The experiments conducted by this group, for example, did not show any general over-all increased learning as a result of using color in instructional films.[5] This leads to the conclusion that, unless the color itself is an important part of the film--such as color being the only means of identifying different items--the increased cost of the color film is not offset by increased learning.

The conclusions reached by the Instructional Film Research Program, if applied carefully and critically to the production and utilization of films for flight training, can result in a saving of both time and money as well as an increase in the efficiency of learning by the flight students.

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[5] VanderMeer, Relative Effectiveness of Color and Black and White in Instructional Films, (Technical Report SDC 269-7-28, Instructional Film Research Program; State College, Pennsylvania: Pennsylvania State College, 1952).

Motivation of students. Another problem, which is constantly growing more serious, is the fact that most young men seem to be losing the keen desire to fly which was so evident in World War II. Both the Navy and the Air Force are finding it increasingly difficult to recruit the necessary numbers of candidates for flight training which they must have to maintain their aviation forces in a proper state of readiness.

Obtaining flight students is not, however, a direct problem of the flight training schools. Their problem is to keep the students who are already in the program well motivated with a desire to complete the program and to fly with the Navy. This is becoming more difficult for several reasons. One is that flying has lost some of the glamour which it held in its infancy. The day of rugged individualism in military flying is past. The present military pilot is a well-trained and well-disciplined aviator who does not throw regulations to the wind as soon as he enters an aircraft. Another reason for the difficulty in keeping students in the flight training program is the sociological changes which have occurred during the past twenty years. According to Vice Admiral John Dale Price, former Chief of Naval Air Training:

> Young men of today tend to look upon flying as a vocation comparable to any other profession. They coldly weigh its assets and liabilities as they would jobs in the commercial world. The larger number of trainees required means that a larger proportion of

> those not well motivated are accepted. We still have as many men entering our training program who have courage, ability, and enthusiasm as we used to have, but we now have many more in addition who do not basically have such spirit.[6]

There are many factors which contribute to this lack of motivation on the part of many flight trainees. Admiral Price lists the following among the most important:

> 1. We are not in an all-out war. The country is not being attacked; there is no obvious current threat to our existence.
>
> 2. The draft law requires only two years of compulsory military service. Flight trainees must sign up for four years. If they discontinue flight training, all they have to complete is two years.
>
> 3. The trainees are living in a period of inflation. Jobs are plentiful and money is easy to make, especially for young men of such fine caliber. The cadet's pay is inadequate as compared with the income of his civilian colleagues. In addition, his outlook for future military pay likewise provides little incentive.
>
> 4. The additional pay which is given for extra-hazardous duty is in constant jeopardy.
>
> 5. There is little real security to offer the student. The pay, the career, the retirement benefits, and even the day-to-day existence of the military man depend entirely on legislation which is constantly subject to change.[7]

Maintaining a high motivational level for a student who is eager to fly is no real problem. It is the flight student who enters the program without being sure that this

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[6] "It's Harder to Recruit Fliers: Interview with Vice Admiral John Dale Price," U. S. News and World Report, 34:35, February 6, 1953.

[7] Ibid.

is "really what he wants to do" who must be encouraged and convinced that he has made the right decision. Motion pictures play their part in helping to motivate the student. Appeals are made to his patriotism. Many of the films of Naval aviation combat in World War II are still shown. The part that the Navy played in winning the war is shown, and the fact that Naval aviation, of which he is a part, will play a major role in defending the United States if she is attacked again is impressed upon the student. The idea of excitement and adventure is stressed by showing films of the Navy in action all over the world. These motion pictures also point out the travel opportunities which the student will have as an aviator flying with the Navy.

The attrition rate in the Navy flight training program--the percentage of students who fail to complete the course of instruction--has decreased until it has reached a level of slightly less than twenty-four per cent. Figure 8 shows the attrition rate in Naval air training since World War II. The lowering of the attrition rate indicates that more reliable methods of selecting students for flight training are being devised and that more of those candidates who are unfit for flight are being eliminated by such methods.

Flight safety. Flying is inherently dangerous. The combination of high speed and the gravitational pull of the

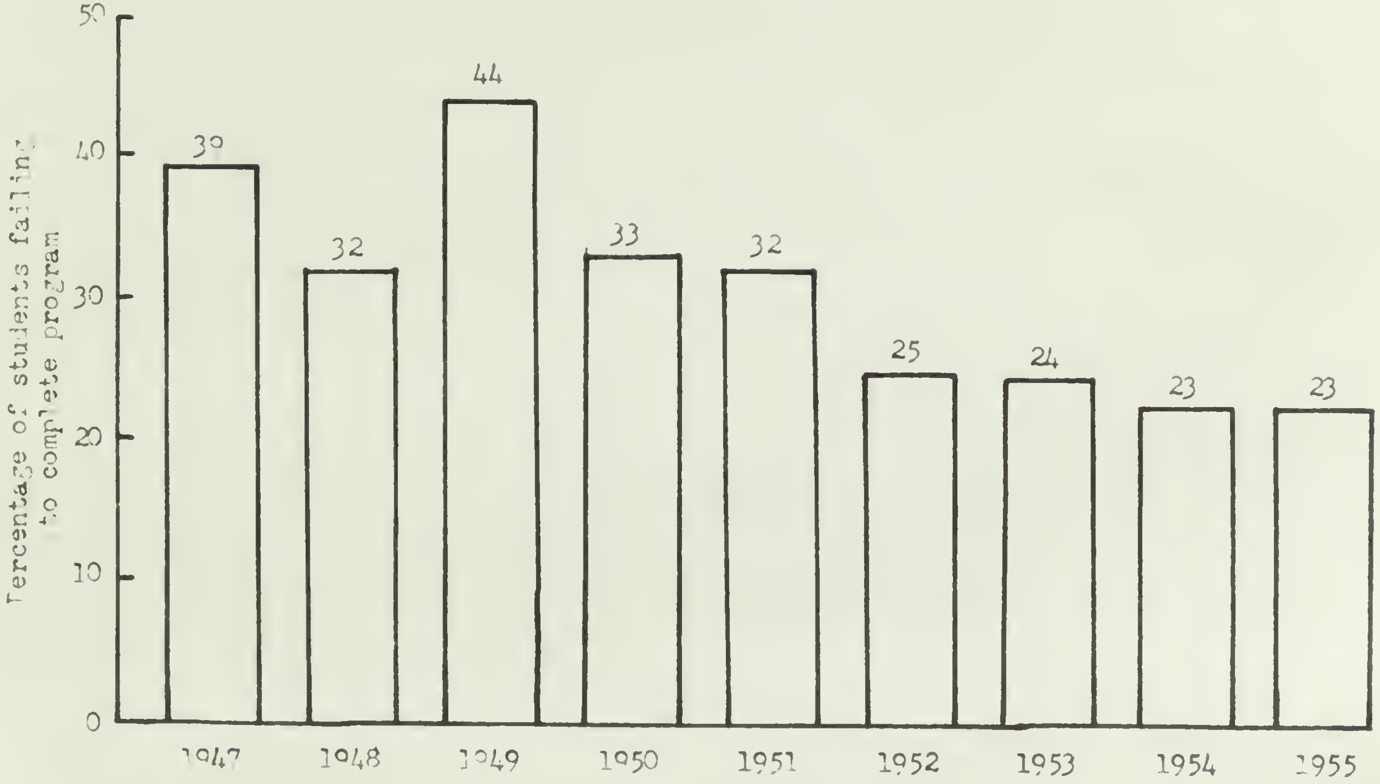

Figure 8. Attrition rate in the Naval Air Training Command since World War II. (From Training Your Air Navy.)

earth results in situations conducive to accidents much more than in most other fields of endeavor. Vice Admiral John H. Cassidy, speaking to a Senate committee in May, 1952, said that Naval aviation in 1950 was twenty times more hazardous than flying a scheduled airline. According to Admiral Cassidy, "One out of every four who qualify as pilots expects to lose his life in an aviation accident."[8]

Because of the basically dangerous nature of flying, a vigorous program of aviation safety, designed to reduce aviation accidents to a minimum, constantly must be directed toward flight trainees--as well as toward qualified aviators. Apparently the weakest link in the chain of flight safety is the pilot himself. A far larger proportion of aviation accidents is caused by error in the judgement of the pilot than by any other factor. Flying is a field in which every pilot must strive to be perfect. The slightest error he makes, whether in flight planning, control manipulation, emergency procedures, or any other phase of flight, can lead to conditions which are potentially fatal. Many studies have been and are being conducted on the psychological relationship of the pilot to flight safety.

One of the ways in which motion pictures aid in the aviation safety program is to make the flight student aware

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[8] G. van Deurs, "The Admiral Sounds Off," Flying, 53:22, July, 1953.

of the need for safety in all phases of flight. Very few students are deliberately unsafe in their flying practices. The trouble usually arises because the pilot is not aware of the developing danger, and by the time he does realize the situation it is beyond his capability to cope with it. Many of the more common dangers of flight can be presented to the trainee through the use of motion pictures. Films are ideally suited for this because dangerous situations can be presented on film without any danger to the student who is viewing the happenings. He is taught to recognize the potential trouble at an early stage of development, he is able to analyze the factors which caused the formation of the dangerous situation, and he can be taught how to avoid similar situations. Of course, not all the dangerous situations of flight can be shown on film--these are practically unlimited--but many of the more common causes of accidents in flight training are presented in this manner.

Visual presentation of this sort is also beneficial in another way. Things happen so fast in modern aircraft that the pilot, instead of concentrating solely on what he is doing at the moment, must be planning ahead at all times. If the student can be taught to incorporate a positive approach to safety into his planning, it will greatly aid in reducing the chances of his having an accident.

The accident rate in the Naval flight training program has been decreasing until it reached a low of 3.72

accidents per 10,000 hours flown in Advanced Training in 1955, the latest year for which figures were available.[9] Figure 9 shows the accident rate in Basic Training and in Advanced Training from 1949 to 1955.

This steady decrease in the aircraft accident rate has not, of course, been due solely to the use of motion pictures--many other factors have contributed to it also. In order to fly safely, however, the pilot must have a complete understanding of all phases of flight. The use of films to assist in teaching the various subjects in all stages of the flight training program helps the pilot to comprehend the material which is essential to flight safety.

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[9] Training Your Air Navy, p. 34.

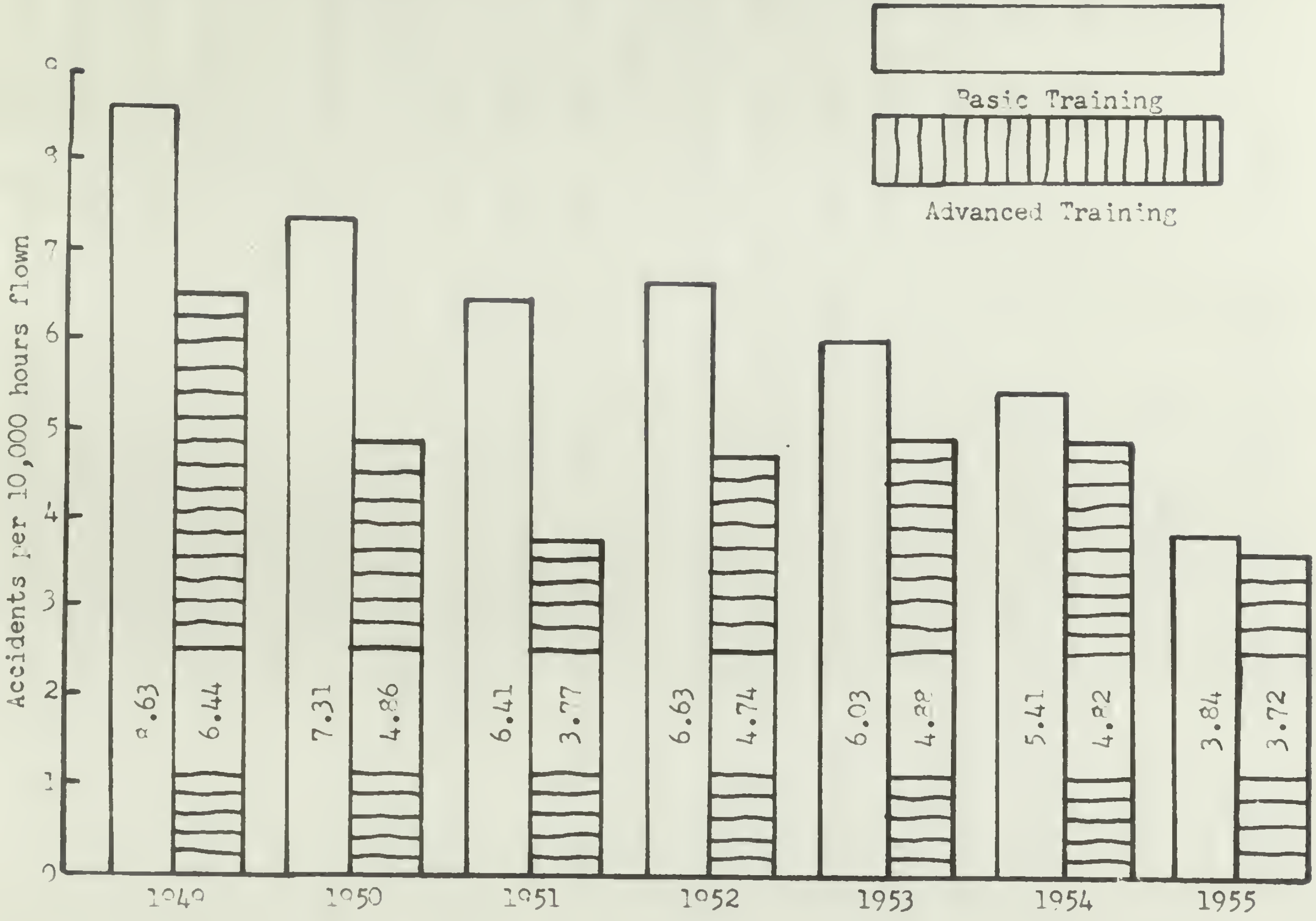

Figure 9. Aircraft accident rate in the Naval Air Training Command from 1949 to 1955. (From Training Your Air Navy.)

# CHAPTER VI

# SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

## I. SUMMARY

This thesis has discussed the development of audio-visual training within the Naval organization. The ground and flight syllabi of Pre-Flight, Basic Training, and Advanced Training have been reviewed. The particular courses and areas within the flight training program where motion pictures are utilized have been examined in detail and their relationship to other audio-visual aids has been discussed. Some of the problems of the flight training schools and the extent to which motion pictures help to solve these problems have been analyzed.

The use of motion pictures and other audio-visual training aids was quite limited in training programs throughout the Navy prior to World War II. The tremendous influx of men into the service after the start of the war and the need to train these men quickly and thoroughly gave rise to the audio-visual program within the Navy. The training Aids Development Center, the Special Devices Center, and the Naval Photographic Center were all created during World War II.

The path which the aviation cadet follows to become a Naval Aviator leads through Pre-Flight Training, Basic

Training, and Advanced Training. Through a coördinated program of ground school and flight training, which lasts approximately eighteen months, the student acquires the skills and knowledge which are necessary to pilot the complex, high-performance aircraft which are used by the Navy today.

There are 112 different films listed in the syllabus of the flight training program, and there are possibly an equal number of unlisted but often-used films. Many of the motion pictures used were produced during World War II. These training films still give excellent coverage of the material presented, and no need to replace them has been felt.

Other audio-visual aids, such as mockups, cut-aways, models, and graphic materials, are used in conjunction with motion pictures. In many cases, the actual equipment under discussion is used in classroom situations.

## II. CONCLUSIONS

Motion pictures are utilized in every phase of flight training. When they are carefully integrated into the training syllabus and are properly utilized, the use of motion pictures results in more and better learning on the part of the students as well as a considerable saving in both the time and money required for training.

Much factual information is taught primarily through

the use of films. This enables the instructor to explain much more of the subject matter in a given length of time. Films also aid in the retention of subject matter.

The motor skills of flying cannot be taught directly by films, but films can aid in shortening the time required to learn such skills. Many of the procedures and techniques of flying are shown on film. These procedures and techniques are then practiced in synthetic devices such as the link trainers and the operational flight trainers. When the student is ready to learn the maneuvers in the air, he has been so well indoctrinated as to what he is going to learn and how he will perform the maneuvers that the actual learning occurs in a much shorter time than would otherwise be required.

In many phases of the flight training program, motion pictures are closely related to other audio-visual training aids. Lectures, films, and aids are combined to teach subject matter which would be much more difficult to teach and to understand if taught by one method alone.

## III. RECOMMENDATIONS

Although motion pictures are used extensively throughout the flight training program, there are certain areas where additional films could be used to advantage. Films on celestial navigation, for example, would aid in the teaching of this difficult subject and would also help the

student to acquire a better basic understanding of a subject which is so important to over-water navigation. These same films could also serve another very useful purpose. Many experienced aviators, who have not had occasion to practice celestial navigation during the past few years, could use these films as a review of the subject.

There are no films listed within the syllabus at the present time which teach the types and techniques of gunnery runs. Films on this subject, emphasizing the subjective camera angle, could prove of great value in teaching students this phase of gunnery.

A series of films designed to motivate the flight student and to increase his desire to complete the training program should prove beneficial in reducing the attrition rate in the Naval Air Training Command. Films are used at the present time to try to accomplish this, but these films were originally made for another purpose and were not produced primarily to motivate and inspire flight students.

Careful consideration should be given to the making of motion pictures which will become obsolete quickly. For example, there are more than twenty films on recognition listed in the Navy Film Catalogue which apply to obsolete aircraft. Principles of recognition can and should be taught by motion pictures, but the use of film strips to teach specific aircraft recognition is much more practical. They can be made at a fraction of the cost and time required

to produce a film, and can be used to amplify the standard recognition slides which are used in the Navy.

The foul-weather use of films within the training command could be examined to see if full use is being made of the educational potential of films. Students learn much more from films when they are motivated to learn. The showing on rainy days of many films which have not been integrated carefully into the over-all training syllabus will result in extremely inefficient student learning as compared to a foul-weather training syllabus which is designed to augment and reenforce the syllabus training. Admittedly, there are many problems in designing an efficient foul-weather syllabus, but the effective utilization which can be made of such time is well worth the difficulty.

Because of the high cost of producing films, all instructors and curriculum planners should be versed thoroughly in the proper utilization of motion pictures. They also should have a basic understanding of the production process and problems. The conclusions of the Instructional Film Research Program, if given wide distribution, would aid immeasurably in increasing the efficiency of the films produced and in the effective utilization of these films in the flight training program.

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# APPENDIX

# APPENDIX

## SELECTED LIST OF UNCLASSIFIED NAVY TRAINING FILMS USED IN THE NAVY FLIGHT TRAINING PROGRAM

### A. AEROLOGY

"Aerology - Air Masses and Fronts." Film MN-119D. 20 minutes, color, sound, 1943.

"Aerology - The Cold Front." Film MN-119E. 18 minutes, color, sound, 1943.

"Aerology - Fog." Film MN-119B. 24 minutes, color, sound, 1943.

"Aeroloty - Ice Formation on Aircraft." Film MN-119A. 47 minutes, black and white, sound, 1943.

"Aerology - The Occluded Fronts." Film MN-119G. 20 minutes, color, sound, 1944.

"Aerology (Thunderstorms)." - Part I - "Formation and Structure of Thunderstorms." Film MN-7409A. 15 minutes, black and white, sound, 1953.

"Aerology - The Warm Front." Film MN-119F. 20 minutes, color, sound, 1943.

"Atmospheric Stability and Instability - Adiabatic Process." Film MN-7894B. 13 minutes, color, sound, 1953.

"Atmospheric Stability and Instability - Stability and the Weather." Film MN-7894D. 8 minutes, color, sound, 1954.

"Precipitation Static." Film MN-5789. 19 minutes, black and white, sound, 1946.

### B. ENGINEERING

"Aircraft Ignition Systems - Magneto Ignition." Film MN-6848. 21 minutes, black and white, sound, 1951.

"Airplane Propellers - Hamilton Constant Speed - Theory and Operation." Film MA-501A. 12 minutes, black and white, sound, 1942.

"Airplane Propellers - Hamilton Hydromatic Propeller - Theory and Operation." Film MA-882A. 16 minutes, black and white, sound, 1942.

"Basic Electricity - Current Flow - What it is." Film MN-8061C. 3 minutes, black and white, sound, 1954.

"Basic Electricity - How Magnets Produce Electricity." Film MN-8061B. 3 minutes, black and white, sound, 1954.

"Basic Hydraulics." Film MN-5027A. 9 minutes, color, sound, 1945.

"Carbon Pile Voltage Regulators - Direct Current Regulators - Principles of Operation." Film MN-4361A. 10 minutes, black and white, sound, 1945.

"Cyclone Combustion." Film MC-237A. 25 minutes, black and white, sound, 1942.

"Operation of Jet Aircraft Engines." Film MA-5396A. 21 minutes, black and white, sound, 1949.

## C. FLIGHT PROCEDURES

"Basic Air to Air Gunnery." Film MN-7398J. 25 minutes, black and white, sound, 1954.

"Carrier Landing Signals." Film MN-7412A. 12 minutes, black and white, sound, 1952.

"Carrier Operations - Aircraft Rendezvous." Film MN-15D. 30 minutes, black and white, sound, 1943.

"Ground Control of Airplanes." Film MN-5823. 13 minutes, black and white, sound, 1945.

"Ground Controlled Approach of Aircraft - Operational Procedure." Film MN-6694. 38 minutes, black and white, sound, 1949.

"Procedures for Carrier Landing Practice." Film MN-7412B. 15 minutes, black and white, sound, 1952.

## D. GUNNERY

"Aircraft Machine Guns and Cannon - .50 Caliber Machine Gun Operation." Film MA-503C. 15 minutes, black and white, sound, 1942.

"Dive Bombing - Drift and Deflection Correction." Film MN-86D. 24 minutes, black and white, sound, 1943.

"Dive Bombing - The Moving Target." Film MN-86K 16 minutes, black and white, sound, 1943.

"Fighter Combat Tactics - The Use of the Illuminated Gunsight." Film MN-84A. 22 minutes, black and white, sound, 1943.

"Introduction to Dive Bombing." Film MN-86A. 25 minutes, black and white, sound, 1943.

## E. NAVAL ORIENTATION

"Cruise of the U. S. S. Farragut." Film MN-6737. 33 minutes, black and white, sound, 1952.

"Enlisted Classification - The Right Man for the Right Job." Film MN-7307. 20 minutes, black and white, sound, 1951.

"Fighting Lady's Family." Film MN-6739. 33 minutes, black and white, sound, 1950.

"The Naval Establishment - The Navy Department." Film MN-6992A. 16 minutes, black and white, sound, 1952.

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"Shipboard Organization." Film MN-6801. 18 minutes, black and white, sound, 1950.

"The Story of Naval Aviation." Film MN-7969. 27 minutes, black and white, sound, 1954.

"The Uniform Code of Military Justice - The Code and You." Film MN-7319A. 24 minutes, black and white, sound, 1952.

"The Uniform Code of Military Justice - Non-Judicial Punishment." Film MN-7319D. 22 minutes, black and white, sound, 1952.

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"Aids to Navigation - How to Use Navigational Aids." Film MN-202AC. 7 minutes, color, sound, 1944.

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"Multi-Engine Plane Navigation." Part I. Film MN-1337A. 16 minutes, black and white, sound, 1945.

"Navigation - Aerial Map Reading." Film MN-83M. 22 minutes, black and white, sound, 1944.

"Navigation - Charts." Film MN-83. 18 minutes, black and white, sound, 1942.

"Navigation - Dead Reckoning (Air)." Film MN-83J. 34 minutes, black and white, sound, 1944.

"Navigation - Plotting Board - The Mark 3 A Plotting Board." Part I "Course and Heading." Film MN-83AD. 10 minutes, black and white, sound, 1944.

"Navigation - Plotting Board - The Mark 3 A Plotting Board." Part II "Geographic Plot; Mark 8 Computer." Film MN-83AE. 12 minutes, black and white, sound, 1944.

## G. PRINCIPLES OF FLIGHT

"Compressibility Effects on Naval Aircraft." Film MN-5895. 30 minutes, black and white, sound, 1947.

"Elementary Aircraft Performance." Film MN-8037. 17 minutes, black and white, sound, 1953.

"The Stall, The Spin, The Pilot." Film MN-6829. 20 minutes, black and white, sound, 1950.

## H. SURVIVAL

"Airborne Liferaft - Radar Reflectors." Film MN-4495. 11 minutes, black and white, sound, 1944.

"Castaway." Film MN-2306A. 61 minutes, black and white, sound, 1944.

"Emergency Rescue Equipment - The Signaling Mirror." Film MG-3344. 10 minutes, black and white, sound, 1944.

"Making Sea Water Drinkable with the Solar Still and Desalting Kit." Film MN-7918. 14 minutes, black and white, sound, 1953.

"Survival in the Arctic Tundra." Film MA-6948. 70 minutes, color, sound, 1949.

"Use of Parachutes." Film MN-5301. 15 minutes, black and white, sound, 1946.

"Your Safety Harness." Film MA-4488. 9 minutes, black and white, sound, 1944.

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